

IN THE DESCRIPTION

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B [0043] An injection molding apparatus according to the present invention is shown generally in the Figures at M. Apparatus M comprises a nozzle mold plate 20 and a cavity plate 13 cooperating with a mold core 10 along a parting line PL to form a mold cavity 11 therebetween. An injection molding machine (not shown) has an injection nozzle (not shown) which communicates with a heated runner system 30 via a sprue bushing 32 to provide molten plastic therethrough, under pressure. A locating ring 21 is provided to position the molding machine. Runner system 30 communicates through an inlet sleeve or body 17 with ~~an annular~~ a melt channel 12 centrally located in an injection nozzle 7. Injection nozzle 7 has a nozzle head 15 and is positioned in a nozzle plate 6 positioned substantially in cavity plate 13. Runner system 30 is maintained at a desired operating temperature by inlet body heater elements 16, nozzle heater elements 14 and a thermocouple 9 communicating with a suitable control system (not shown), as is well known in the art. Centrally disposed in melt channel 12 of nozzle 7 is a valve pin 1 which is axially movable in nozzle 7, for reasons described in more detail below, by the cooperation of an activating cylinder 19 (which may be pneumatic or hydraulic, as is well known in the art), and a rack and pinion motion transfer gear train 18.

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B2 [0046] Valve pin 1, valve stem 1', valve head 2, melt channel 12, transition 38 and opening 36 are substantially circular in cross-section so as to ~~give melt channel 12~~ define an annular ~~shape~~ melt passage (between valve pin 1 and nozzle 7) and give gate 24 an annular entry into mold cavity 11. Valve stem 1' has an outside diameter  $D_1$  and head 2 has an outside diameter  $D_2$ , while melt channel 12 has a diameter of  $M_1$  and opening 36 has an inside diameter  $M_2$ . As can be seen from Figure 2, head 2 diameter  $D_2$  is slightly less than opening 36 diameter  $M_2$  to permit head 2 to be inserted into opening 36 to close gate 24, as will be described in more detail below.

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